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**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Application Number: 10/629,259
Filing Date: July 29, 2003
Appellant(s): HAMILTON ET AL.

Laura M. Kelley
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 18 August 2008 appealing from the Office action mailed 10 January 2008.

**(1) Real Party in Interest**

A statement identifying the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of the claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The rejection of claims 1-20, 24, 25, 29, 30 and 32 under the first paragraph of 35 U.S.C. 112 as failing to comply with the written description requirement was withdrawn following the pre-appeal brief conference. Withdrawal of this rejection was communicated to appellant by telephone on 14 July 2008 as noted in the Interview Summary mailed 17 July 2008.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

| | | |
|---|---|---|
| US 5619995 | Lobodzinski | 04-1997 |
| US 5997883 | Epstein et al. | 12-1999 |
| US 2003/0206646 | Brackett | 11-2003 |
| US 6500123 | Holloway et al. | 12-2002 |
| US 2004/0015079 | Berger et al. | 01-2004 |
| US 5680862 | Song | 10-1997 |

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

1. Claims 1-10, 12-19, 25-27, 28-29 and 31-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lobodzinski (US 5,619,995) in view of Epstein et al. (US 5,997,883).

Lobodzinski discloses a system for used with diagnostic imaging systems for the acquisition, display, and processing for enhanced visualization of data in real-time while a patient is undergoing a cardiac stress test. Although much of the disclosure is directed to an ultrasound system, other systems may be used such as a "cardiac Magnetic Resonance Imaging apparatus" (col. 8, line 10). Lobodzinski states that although most diagnostic imaging systems provide some sort of cine loop review (col. 2, line 4), they typically do not provide without the additional processing and display that Lobodzinski discloses. The analog and/or digital inputs (cine-loops included) are adjusted based on heart rate where the number of frames obtained is based on the heart period (col. 13, line 15; also col. 11, lines 33-50). Two or more such loops may be synchronized and simultaneously displayed. Frames may be removed from the slower

heart rate loop so that the cycles will be displayed simultaneously (col. 13, lines 24-35) so that the temporal placement of the frames in each cycle are the same and therefore each cycle has the same number of frames (figure 7). Lobodzinski states that cycle synchronization is important in stress testing, as patient management decisions are made from visual assessment of the motion displayed simultaneously (col. 13, lines 1-36 for temporal synchronization). Simultaneous side-by-side comparisons may be used during examination for diagnostic purposes (col. 1, lines 61-65). Workstation features of selecting dose amount(s), alternate view(s) and rapidly switching between displays are well known to those of ordinary skill in the art and it would be obvious to incorporate them in order to yield expected results of ease of use and enhanced visibility of physiologic data.

Stress studies are done consisting of two or more sets of, for example pre- and post-exercise, cardiac imaging data (col. 5, line 10). The pre-exercise data establishes a baseline dataset. Comparison may also be made between different locations, or projections, of the heart during the same study (col. 13, lines 8-10). Additionally, characteristics of the loops may be adjusted, including editing functions (col. 12, line 17). The size of the display area and the frame rate may be adjusted for one or more loops (col. 12, lines 60-65). When more than one loop is selected for display, the display area is automatically adjusted and the size of all of the frames in the selected loop, as well as those in the other loop are adjusted as well (col. 12, lines 38-42 and figure 6). The adjustments of Lobodzinski are real time, and the system is compatible with known digital and analog input formats (col. 11, lines 32-34; also line 45 for real time). Single frame manipulation is disclosed at col. 11, line 59 – col. 12, line 17, and also at line 31. The manipulation techniques of Lobodzinski are real-time capable (Abstract), with "compression

performed in less than x-milliseconds" (col. 3, lines 63-64) and real-time video and audio compression/decompression and temporal domain processing (col. 4, lines 40-43).

Lobodzinski discloses all features of the invention as substantially claimed as detailed above, but does not specify acquiring a plurality of different views or selecting one of a dose amount, a view, or at least one dose amount and at least one view; however, in the same field of endeavor, Epstein et al. (US 5,997,883) disclose showing the heart at different phases of its cycle or at different slice locations which are different anatomical views (col. 1, lines 45-47). Epstein et al further disclose selecting views from each heartbeat based on cardiac phase (Abstract). It would have been obvious to one of ordinary skill in the art at the time of invention to acquire multiple anatomical views, as taught by Epstein et al, with the system of Lobodzinski in order to correlate each time-stamped view with a phase of the cardiac cycle (Epstein, col. 4, lines 51-57).

Regarding claims 25 and 31, Epstein discloses identification of systole without MR fluoroscopy (Fig. 2; equation at col. 4, line 48; col. 3, lines 49-53). Epstein further discloses acquiring images on a patient with a heart rate of 60 bpm (col. 3, line 21; also col. 7, lines 44-45 and line 67) with a temporal resolution of 48 msec (that is, according to the equation(s) at col. 2, line 57-67, with 8 views per segment disclosed as commonly used in the art and a TR of 6 ms disclosed at col. 6, line 36). The scan of Epstein is accomplished within a single breathhold (or about 16 heart beats, disclosed at col. 2, line 44, which at a heart rate of 60 bpm corresponds to a breathhold duration of about 16 seconds).

Regarding claims 28 and 29, he system of Lobodzinski as appended by Epstein includes all features of the invention as substantially claimed, including acquisition of baseline data (comparison of pre- and post-exercise data for different views is established as conventional in

the art by Lobodzinski at col. 5, lines 11-12). Lobodzinski further discloses a processor for automatic comparison of cine loops at different heart rates, including comparison to previously recorded sequences (col. 4, lines 39-44). It would have been obvious to compare to the previously recorded pre-exercise (baseline) sequence for the purpose of evaluating the change induced on the heart prior to and after administering a stress (here, exercise).

Regarding claim 32, the method steps addressed above require an associated workstation.

2. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lobodzinski in view of Epstein et al. as applied to claim 1 above, further in view of Brackett (US 2003/0206646). Lobodzinski as appended by Epstein, as discussed above, discloses selection of which frames to include in the cine loop, for example by removing frames, however fails to explicitly disclose that frames may be added by repeating frames from a cine loop. Brackett also discloses a system for diagnostic imaging including the use of cine loops for storing and displaying imaging data. Additionally, Brackett discloses that duplicate frames may be inserted between existing frames in order to achieve a given display frame rate (paragraph 29). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Lobodzinski in light of the teachings of the reference by Brackett to add the capability to repeat frames in order to, as Brackett states, achieve smoother transitions, or to provide another way to achieve desired frame rate.

3. Claims 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lobodzinski in view of Epstein et al. as applied to claims 1 and 19 above, further in view of Holloway, et al (US 6500123). Lobodzinski as appended by Epstein et al, as discussed above, discloses synchronizing frame loops, such as a baseline loop and a stress test loop, however fails to

disclose registering the two loops. Holloway also discloses a system for comparing images during stress test heart studies and further discloses that images may be aligned through transformation of one data set to the coordinate system of the other, also known as registration, in order to allow differences and similarities between the views to be readily observed. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Lobodzinski in light of the teachings of the reference by Holloway to include registration in order to provide, as Holloway states, improved alignment and to reduce variability in diagnoses (col 1, lines 45-65).

4. Claims 21-24 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lobodzinski in view of Berger et al. (US 2004/0015079) and Song et al. (US 5,680,862).

Lobodzinski, as discussed above, substantially discloses the invention as claimed including adjusting the display size of the loops. However, Lobodzinski fails to explicitly disclose cropping frames to provide a portion of the frame or adjusting one of a contrast, brightness, gamma and opacity characteristic. Song also discloses an imaging system using MRI cine display where the images displayed in the cine loop are cropped to a region surrounding the left ventricle (col. 8, lines 60-65). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Lobodzinski in light of the teachings of the reference by Song in order to including a cropping function to provide improved visualization of details of the heart, such as the left ventricle. Berger et al. disclose an imaging system optionally using MRI cine display with user-adjusted brightness and contrast parameters (pars. 443-444) with preferred touchscreen capability (pars. 143 and 314). It would have been obvious to one of ordinary skill in the art at the time of invention to allow for characteristics such

as brightness, contrast and opacity to be adjusted by the user in order to enhance visibility of the display, and to alter those parameters by way of a touchscreen, as taught by Berger et al.

**(10) Response to Argument**

Regarding the section 112 rejection, the rejection of claims 1-20, 24, 25, 29, 30 and 32 under the first paragraph of 35 U.S.C. 112 as failing to comply with the written description requirement was previously withdrawn as noted in the Interview Summary mailed 17 July 2008. Since the section 112 rejection has been previously withdrawn it is not addressed further.

Appellant's arguments filed 18 August 2008 have been fully considered but they are not persuasive.

Appellant asserts that the method(s) of Lobodzinski are substantially different from the claimed invention because they are primarily directed to a digitized, real-time video stream. Examiner disagrees. The video stream is not substantially different from a cine stream, as the cine loops, when presented serially and in real time as claimed, are effectively video, which by definition is a series of still images displayed in time so as to create a motion picture, in which the movement of a displayed object is captured. The system of Lobodzinski is compatible with a number of known digital and analog input formats (col. 11, lines 32-34; also line 45 for real-time manipulation and display). Single frame manipulation is disclosed at col. 11, line 59 – col. 12, line 17, and also at line 31. All image processing of Lobodzinski, including frame manipulation and review, is identical to the claims as presented, and is identical regardless of cine, DIACOM, or any other known input sequence. While the disclosure of Lobodzinski recognizes the technical difference between video stream and cine, digital and analog sequences, it is

understood that each are formats that are conventional in the art that can be used interchangeably and compatibly with the methods of Lobodzinski. The same goes for the preferred imaging modality for the cardiac stress test: echocardiography and cardiac MR imaging are both compatible for use with the processing and display algorithms of Lobodzinski (stress echocardiography and other modalities at col. 6, lines 46-52; also col. 8, lines 6-13 for various imaging modalities and generating data in either analog or digital format, which would include both cine and digital motion video sequences). Cine loops (or equivalent media known to those skilled in the art) are viewable during administration of the stress test in real-time in the method(s) of Lobodzinski.

Appellant argues that the MRI stress test cited in Lobodzinski is not applicable for the instant claims on the assumption that past MRI cine loops were asynchronous, with manipulation of data following data collection at a later time. Examiner disagrees and points out that the processing methods of Lobodzinski are in fact real time, such that acquisition takes place in conjunction with processing and analysis, and even though synchronous methods are not expressly claimed, the processing and display methods of Lobodzinski are disclosed as synchronous, and appellant's remarks are in error (col. 4, lines 43-45, for "*synchronized real-time serial comparisons* of previously recorded video with archived studies as *well as live video*," emphasis added; also col. 5, lines 19-23 for "image compression… in a continuous real-time fashion"). It is maintained that the image processing, manipulation and review of Lobodzinski is identical regardless of cine, DIACOM, or any other known input sequence.

Appellant asserts that the claimed invention is distinctly different from that of Lobodzinski because it makes use of MRI and makes the point that "MRI builds up a collection

of snapshots of the heart at various points in the cardiac cycle, but these snapshots require many heartbeats to acquire, and, hence, are simply representative of typical images of the heart averaged over those many heartbeats," (see appellant's brief on appeal at p.11). However, the claims merely prescribe that a plurality of different views of the heart at a plurality of different heart rates are visualized throughout the course of administering a stress test and make no specific mention of representations of the heart being averaged in time, or that the set of frames is representative of a single heart cycle. In fact, depending claims prescribe a duration of "at least one full cardiac cycle" (claim 16), and this is consistent with the method of Lobodzinski, as it has been purported by appellant to include "a real-time stream of many heartbeats," (see appellant's brief on appeal, p. 11). This characterization of Lobodzinski is consistent with the invention as claimed.

The methods of Lobodzinski are specific for use with an MR imaging apparatus and are also fully synchronous, to the extent that processing and further manipulation of image frames is executed in real time, contrary to appellant's assertion that the MR image data is collected in the invention of Lobodzinski for manipulation at a later time (see appellant's brief on appeal, p. 11). It is additionally noted that the method of the invention is not prescribed as synchronous in the claims, per se. The claims prescribe that the looped frames are temporally synchronized, and the method of Lobodzinski is clear to teach synchronizing frames temporally (col. 6, lines 5-17, in which temporal synchronization is accomplished in assigning physiological timing events to the frames in a sequence, with loops created based upon the event indexing; also col. 6, lines 18-20; and synchronizing framed sequences and indexing according to ECG or blood pressure signals at col. 6, lines 30-34 and col. 7, lines 3-8; synchronized and simultaneous display of separate frame

sequences at col. 6, lines 46-52; cycle synchronization during the stress test such that patient management decisions are made from visual assessment of the temporally synchronized sequences at col. 13, lines 1-36). The methods of Lobodzinski are synchronous in that the frame manipulations are performed in real time and in the sense that frame sequences are synchronized temporally and sequences displayed simultaneously.

Display of frame loops during a stress test is accommodated with the methods of Lobodzinski in the sense that they are displayed in real time. Cardiac physiology is assessed during the test such that parameters can be adjusted to avoid injury to the patient by way of cycle synchronization to make patient management decisions from visual assessment of synchronized motion displays (col. 13, lines 1-36). It is understood that these intra-study patient management adjustments of Lobodzinski are effective for avoiding injury to the patient, as claimed. The patient is understood to remain in the scanner while patient management adjustments are made and image frames are manipulated as the methods of Lobodzinski are disclosed as being effective in real-time.

Appellant alleges that the methods of Lobodzinski teach away from the claimed invention because the capabilities of the system of Lobodzinski are contrasted with typical cine loop review in the Lobodzinski disclosure. However, this highlighting of the advantages of the system over the prior art review, storage, and recall capabilities is not interpreted to teach away from the methods of the claimed invention. It is maintained that the image processing methods taught in Lobodzinski, including frame manipulation and review, are identical to those claimed, and are identical regardless of cine, DIACOM, or any other input sequences, analog or digital, that are conventional for use in the art.

Regarding independent claim 21, real-time compression and decompression are in fact disclosed in Lobodzinski (abstract; also col. 1, lines 21-26; also specifics of real time compression beginning at col. 3, line 4). The portions appellant has cited as evidence that Lobodzinski does not make use of real time compression are part of a description of the limitations of the prior art, rather than a description of the invention of Lobodzinski. While it is pointed out in the rejection that Lobodzinski fails to teach adjustment of one of a contrast, brightness, gamma and opacity characteristics, Berger and Song are relied upon in the rejection of claim 21 to modify the method of Lobodzinski to include user-adjusted brightness and contrast characteristics as well as image cropping and resizing and render the claimed invention obvious in light of those teachings.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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